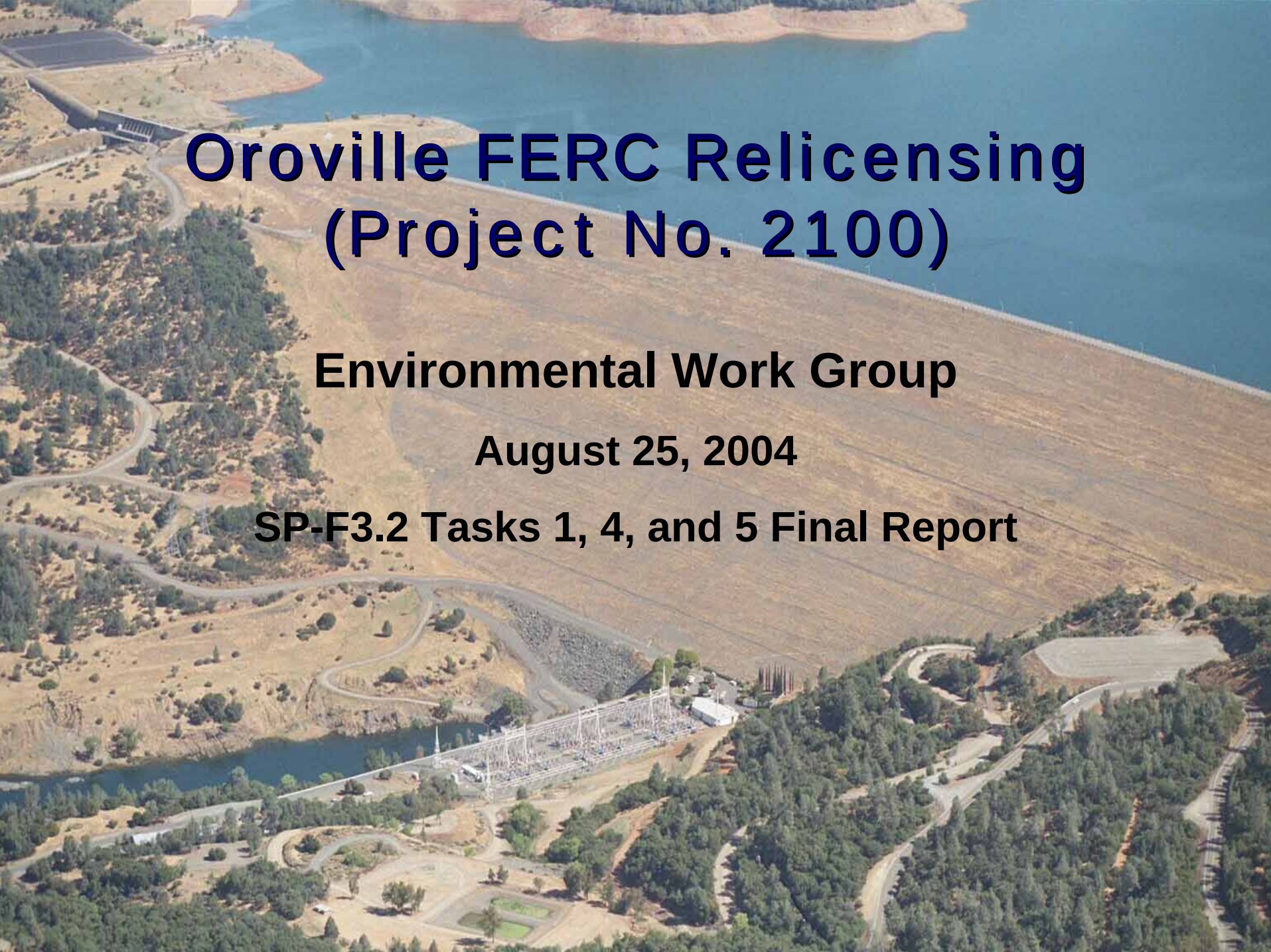


Oroville FERC Relicensing (Project No. 2100)

Environmental Work Group

August 25, 2004

SP-F3.2 Tasks 1, 4, and 5 Final Report

Comparison of Fish Distribution to Fish Habitat in the Lower Feather River

SP-F3.2 Tasks 1, 4, and 5

Methodology
Study Design

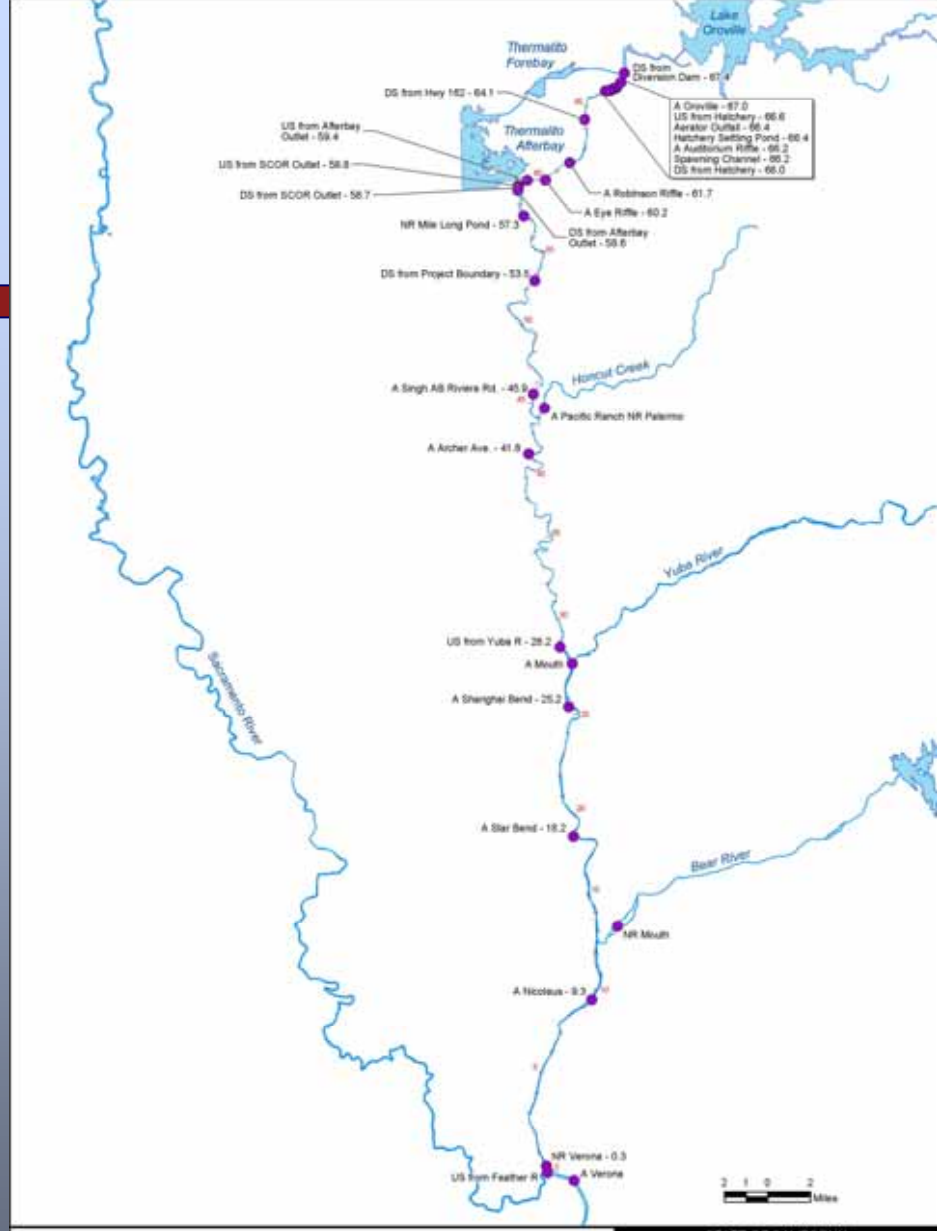
- **Task 1 - Species Distribution**
- **Task 4 - Habitat Distribution**
- **Task 5 - Compare Species and Habitat Distribution**

Need for Study

- **Ongoing operation of the Oroville Facilities influence species and habitat distribution in the lower Feather River.**

Introduction
Study Area

- **Feather River from the Thermalito Diversion Dam to confluence with the Sacramento River**

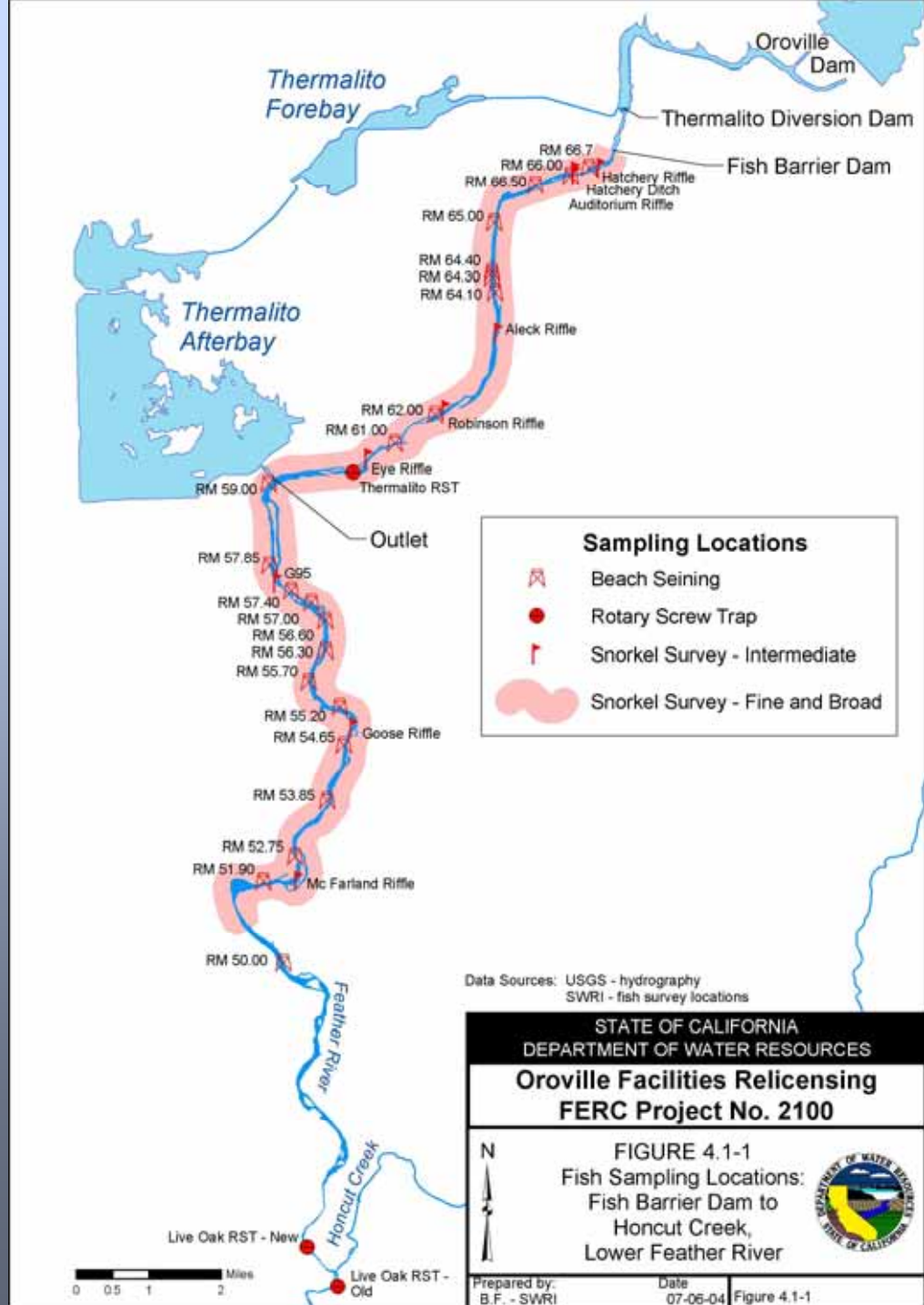


Methodology
Data Collection – Species Distribution

- **Snorkel Surveys**
  - **Broad Scale, Intermediate Scale and Fine Scale**
- **Seining**
- **Rotary Screw Trap**
  - **Thermalito and Live Oak**

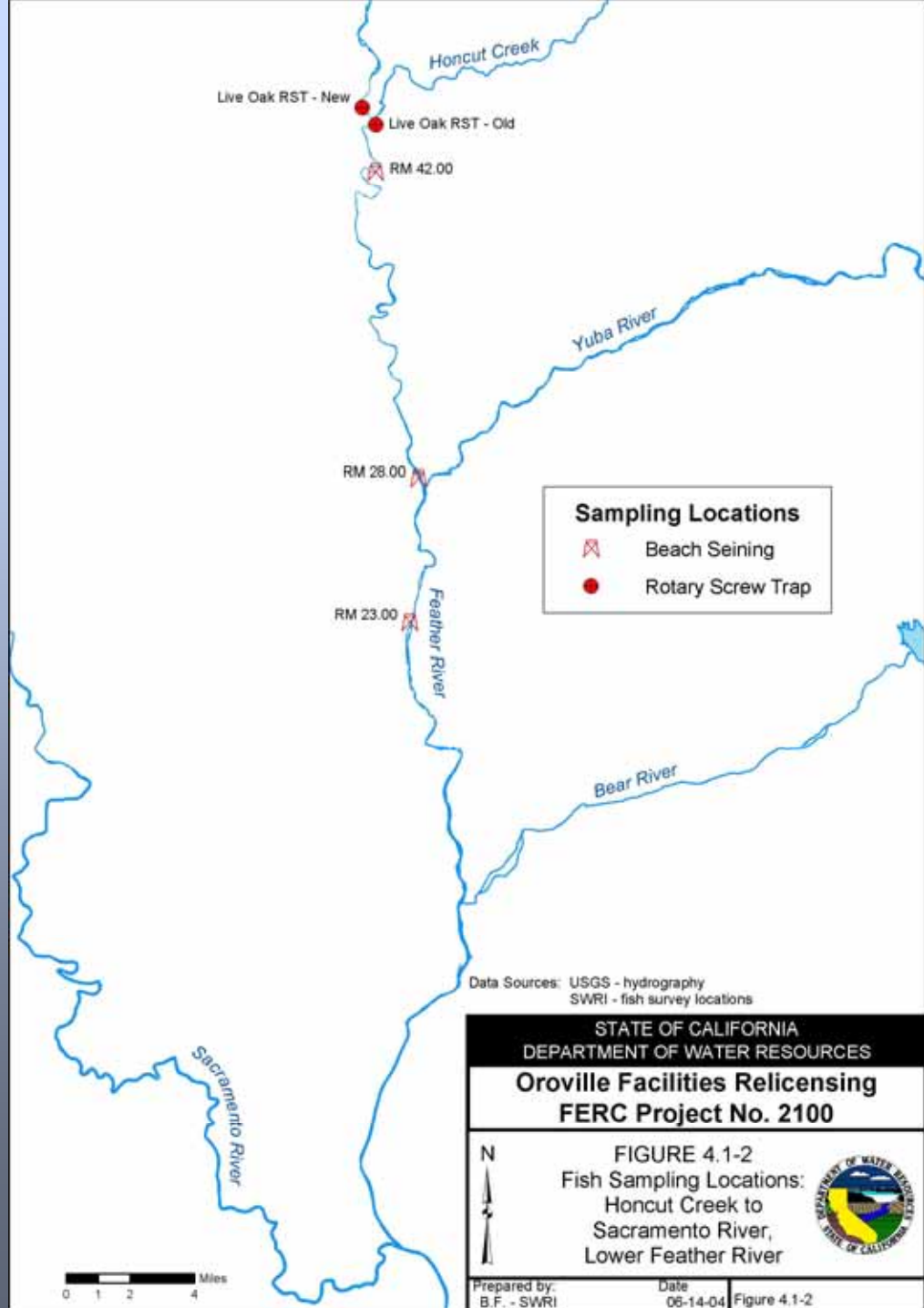
Methodology
Data Collection – Species Distribution

- **Fish Distribution Survey Locations**



Methodology
Data Collection – Species Distribution

- **Fish Species Survey Locations**
  - **Honcut Creek to Sacramento River**



Methodology
Fish Habitat Components

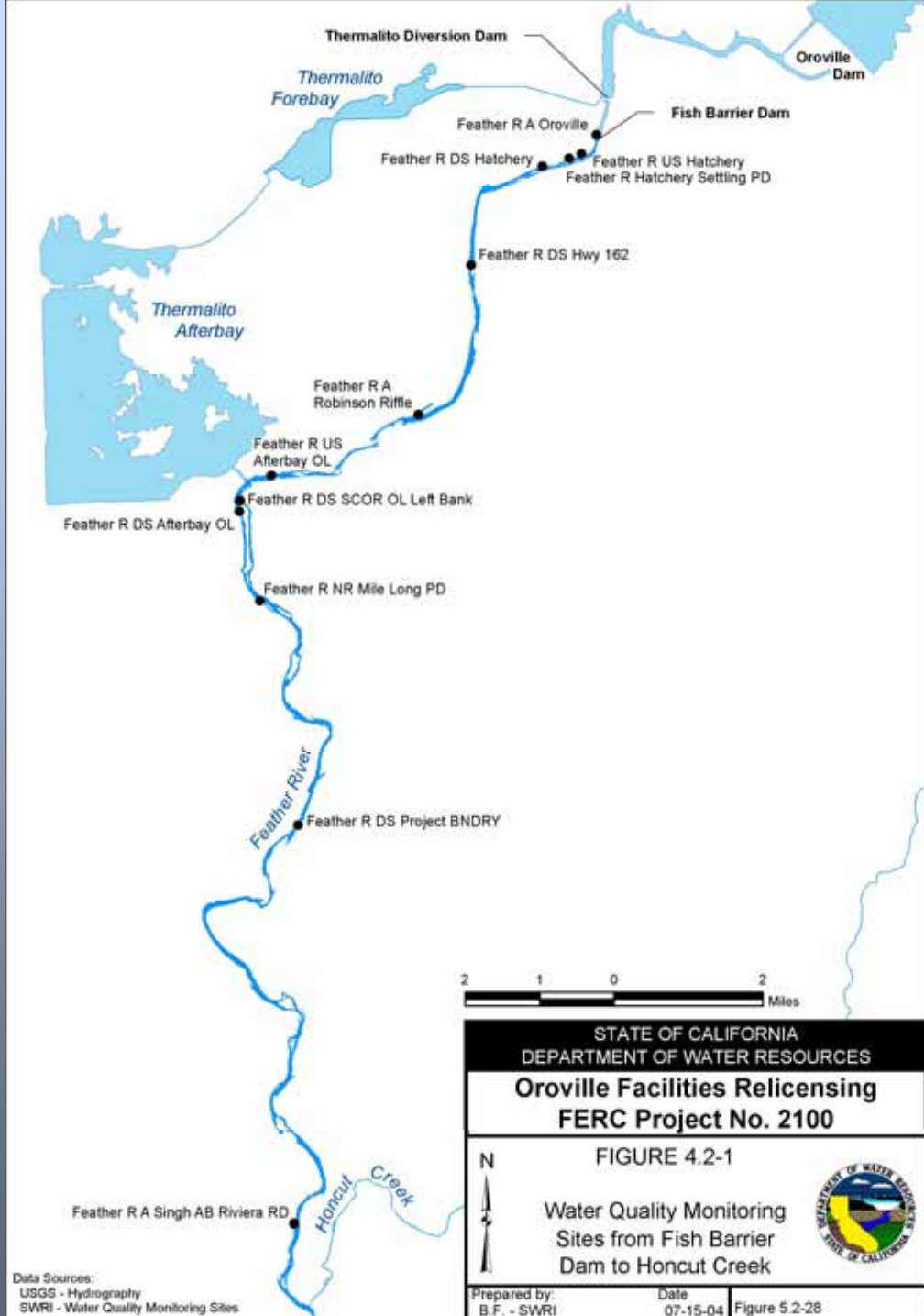
- **Mesohabitat Classification**
  - **Riffle, Run, Glide, Pool, Backwater**
- **Substrate Classification**
  - **Bedrock, Boulder, Cobble, Gravel, Sand, Silt/Clay**
- **Depth Classification**
  - **2-foot intervals**

Methodology
Data Collection – Habitat Distribution

- Instream Cover Complexity Classification
  - None, Low, Medium, High
- Water Temperature Classification
  - 24 thermograph loggers
- Water Quality Exceedence Classification
  - NAWQC
  - CTR
- Dissolved Oxygen Concentration
  - 6.5 mg/L

Methodology
Data Collection – Habitat Distribution

- **Water Quality Monitoring Sites**
  - **Fish Barrier Dam to Honcut Creek**



Methodology
Habitat Classification

- Fish Species Habitat Requirements
  - Habitat Query Form
- GIS Analysis of Habitat Components
- Evaluation of Water Temperatures

F3.2 Habitat Query Form

Species: <Pick One>

Lifestage: <Pick One>

☐ Resident *or* Start Date: _____ End Date: _____ Peak Start Date: _____ Peak End Date: _____

Suitable Mesohabitat (If a class is not selected, it will be excluded):
☐ Backwater ☐ Boulder Run ☐ Glide ☐ Pool ☐ Riffle ☐ Run

Preferred Mesohabitat:
☐ Backwater ☐ Boulder Run ☐ Glide ☐ Pool ☐ Riffle ☐ Run

Suitable Minimum Depth: _____ ☐ feet *or* ☐ meters

Suitable Maximum Depth: _____ ☐ feet *or* ☐ meters

Suitable Substrate (If a class is not selected, it will be excluded):
☐ Bedrock ☐ Boulder ☐ Cobble ☐ Gravel ☐ Sand ☐ Silt ☐ Clay

Preferred Substrate:
☐ Bedrock ☐ Boulder ☐ Cobble ☐ Gravel ☐ Sand ☐ Silt ☐ Clay

Preferred Instream Cover: <Pick One>

Preferred Vegetation:
☐ Aquatic/Sumberged ☐ Open Water ☐ Riparian Forest/Woodland

Suitable Minimum Temperature: _____ ☐°F *or* ☐°C

Suitable Maximum Temperature: _____ ☐°F *or* ☐°C

Preferred/Optimal Minimum Temperature: _____ ☐°F *or* ☐°C

Preferred/Optimal Maximum Temperature: _____ ☐°F *or* ☐°C

Lethal Minimum Temperature: _____ ☐°F *or* ☐°C

Lethal Maximum Temperature: _____ ☐°F *or* ☐°C

Suitable Minimum Dissolved Oxygen (mg/l): _____

Methodology

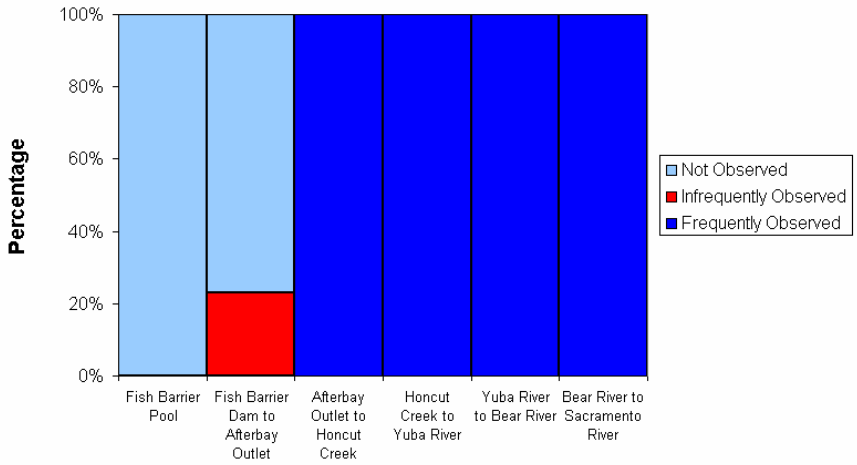
Species Distribution vs. Habitat Distribution

- **GIS Analysis**
  - **Spatial coincidence comparison between fish habitat vs. fish distribution for each species**
  - **Calculation of concurrence or disagreement**
- **Use of the Comparison**
  - **Determine limiting information**
  - **Determine relative degree of confidence in results of the analyses**

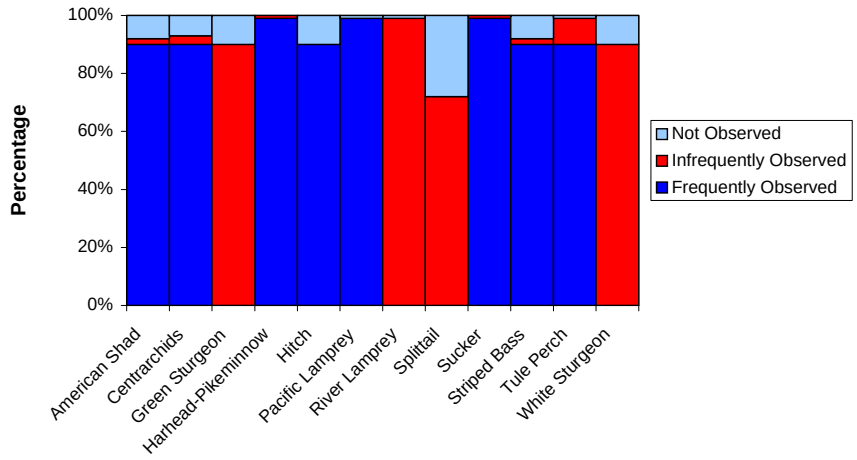
Results - Fish Species Distribution

Fish taxa	Frequently observed	Infrequently observed	Not observed
American Shad	Thermalito Afterbay Outlet to the confluence with the Sacramento River	Steep Riffle to Thermalito Afterbay outlet	Thermalito Diversion Dam to Steep Riffle
Centrarchids	Thermalito Afterbay Outlet to the confluence with the Sacramento River	Thermalito Diversion Dam to the Fish Barrier Dam and from Steep Riffle to Thermalito Afterbay Outlet	Fish Barrier Dam to Steep Riffle
Green Sturgeon		Thermalito Afterbay Outlet to the confluence with the Sacramento River	Thermalito Diversion Dam to Thermalito Afterbay Outlet
Hardhead and Sacramento Pikeminnow	Fish Barrier Dam to confluence with the Sacramento River	Thermalito Diversion Dam to the Fish Barrier Dam	
Hitch	Thermalito Afterbay Outlet to the confluence with the Sacramento River		Thermalito Diversion Dam to Thermalito Afterbay Outlet
Pacific Lamprey	Fish Barrier Dam to confluence with the Sacramento River		Thermalito Diversion Dam to the Fish Barrier Dam
River Lamprey		Fish Barrier Dam to confluence with the Sacramento River	Thermalito Diversion Dam to the Fish Barrier Dam
Sacramento Splittail		Honcut Creek to the confluence with the Sacramento River	Thermalito Diversion Dam to Honcut Creek
Sacramento Sucker	Fish Barrier Dam to confluence with the Sacramento River	Thermalito Diversion Dam to the Fish Barrier Dam	
Striped Bass	Thermalito Afterbay Outlet to the confluence with the Sacramento River	Steep Riffle to Thermalito Afterbay Outlet	Thermalito Diversion Dam to Steep Riffle
Tule Perch	Thermalito Afterbay Outlet to the confluence with the Sacramento River	Fish Barrier Dam to Thermalito Afterbay Outlet	Thermalito Diversion Dam to the Fish Barrier Dam
White Sturgeon		Thermalito Afterbay Outlet to the confluence with the Sacramento River	Thermalito Diversion Dam to Thermalito Afterbay Outlet

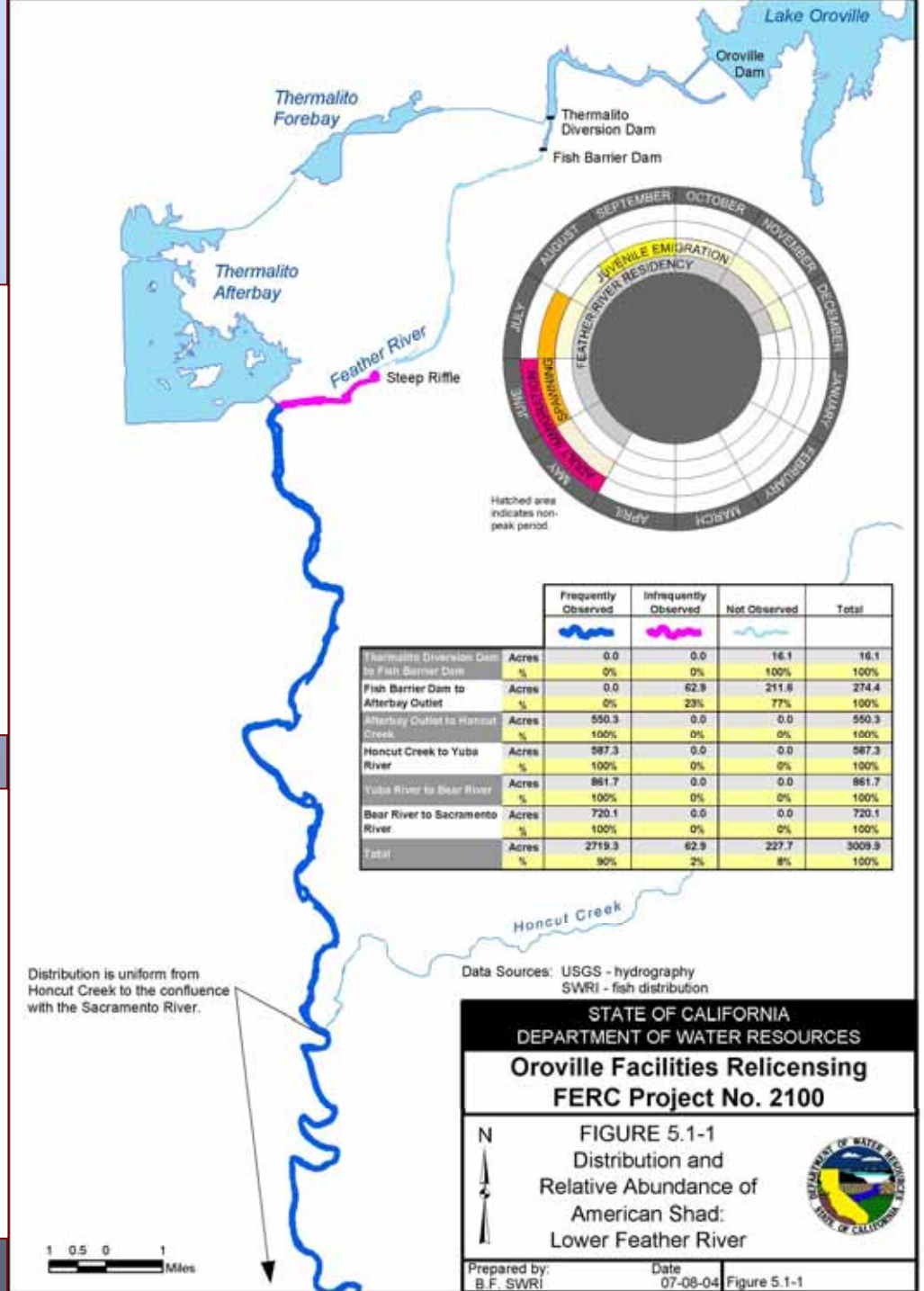
Results – Fish Species Distribution



Proportions of relative abundance of American shad by reach.

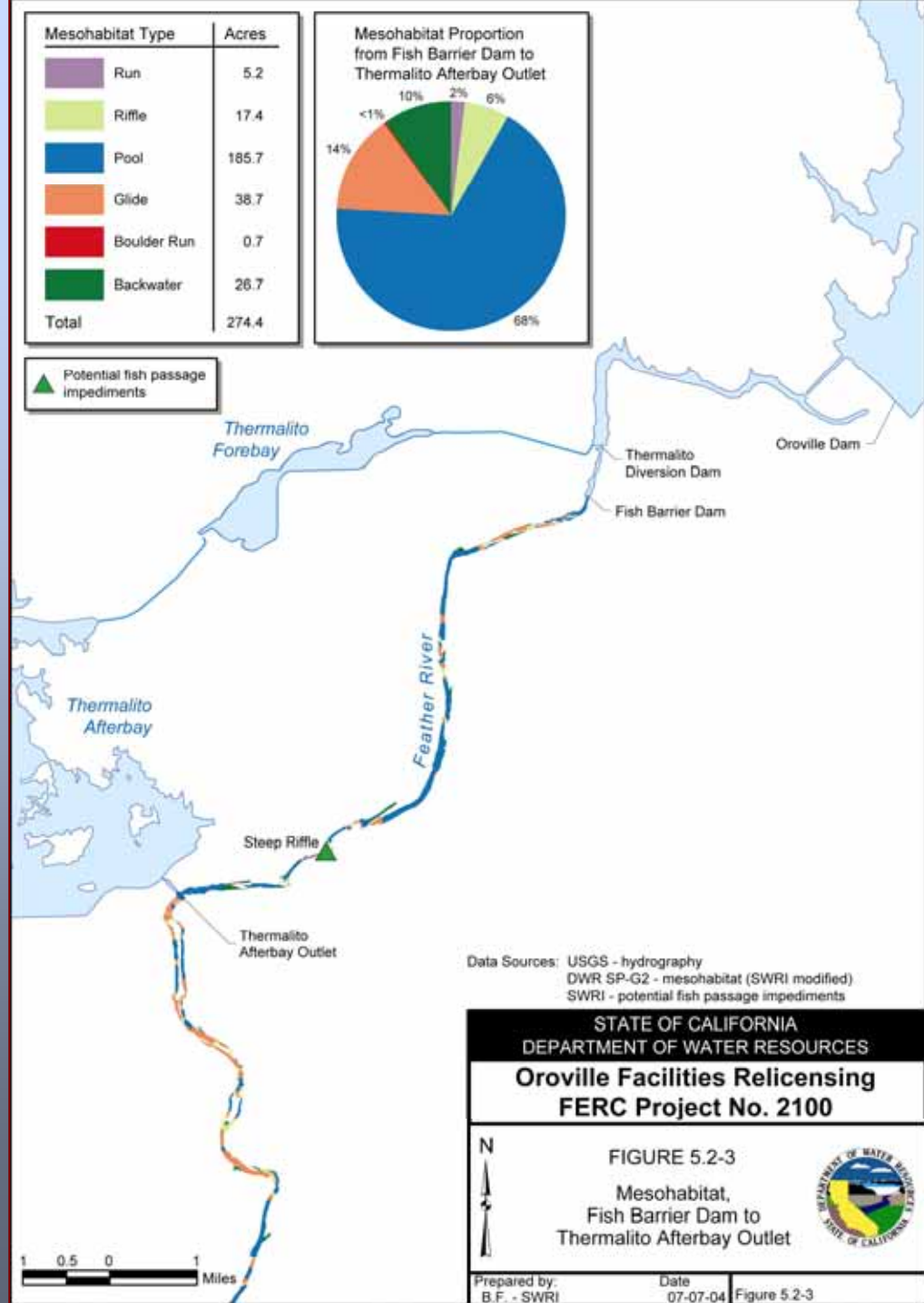


Relative abundance of fish in the lower Feather River by species.



		Frequently Observed	Infrequently Observed	Not Observed	Total
Thermalito Diversion Dam to Fish Barrier Dam	Acres	0.0	0.0	16.1	16.1
	%	0%	0%	100%	100%
Fish Barrier Dam to Afterbay Outlet	Acres	0.0	62.9	211.6	274.4
	%	0%	23%	77%	100%
Afterbay Outlet to Honcut Creek	Acres	550.3	0.0	0.0	550.3
	%	100%	0%	0%	100%
Honcut Creek to Yuba River	Acres	587.3	0.0	0.0	587.3
	%	100%	0%	0%	100%
Yuba River to Bear River	Acres	861.7	0.0	0.0	861.7
	%	100%	0%	0%	100%
Bear River to Sacramento River	Acres	720.1	0.0	0.0	720.1
	%	100%	0%	0%	100%
Total	Acres	2719.3	62.9	227.7	3009.9
	%	90%	2%	8%	100%

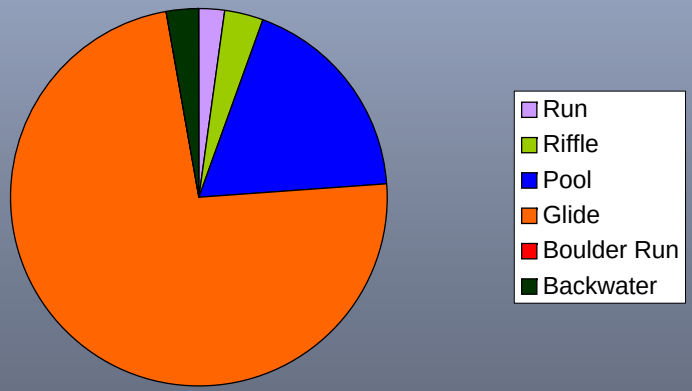
Results – Mesohabitat Distribution



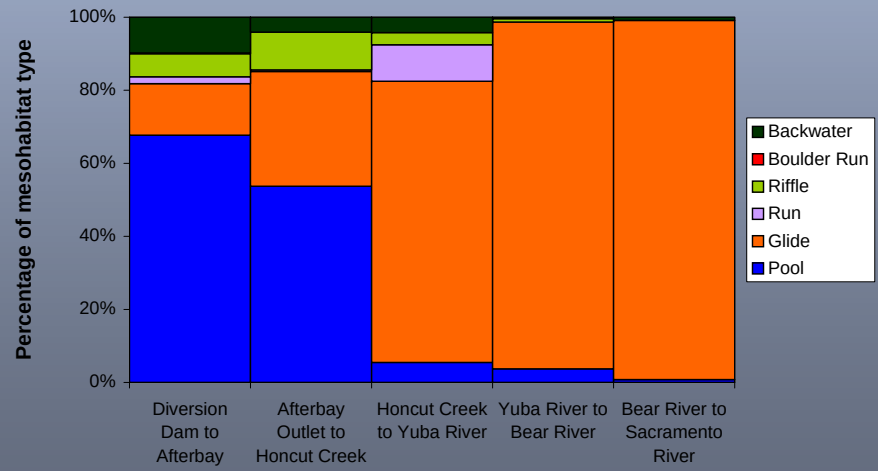
Results – Mesohabitat Distribution

Mesohabitat Type	Diversion Dam to Afterbay	Afterbay Outlet to Honcut Creek	Honcut Creek to Yuba River	Yuba River to Bear River	Bear River to Sacramento River
Run	5	2	59	0	0
Riffle	17	57	20	8	0
Pool	186	296	32	32	6
Glide	39	173	452	818	708
Boulder Run	1	0	0	0	0
Backwater	27	22	25	4	6

Mesohabitat area (acres) by reach in the lower Feather River.



Percentage of mesohabitat types in the Feather River



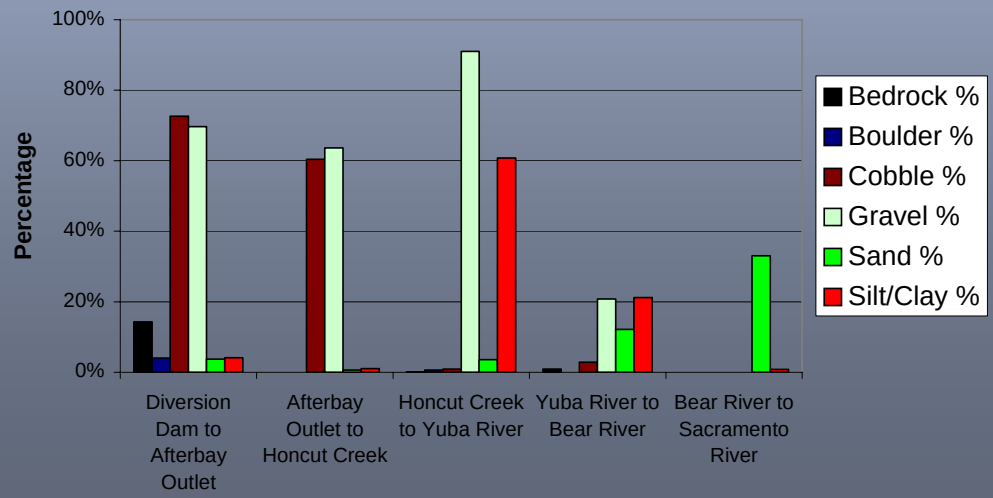
Percentage of mesohabitat type in the lower Feather River by reach

Results – Substrate

Substrate acreage by reach in the lower Feather River

Reach	Bedrock Acres	Boulder Acres	Cobble Acres	Gravel Acres	Sand Acres	Silt/Clay Acres
Diversion Dam to Afterbay Outlet	39	11	199	191	10	11
Afterbay Outlet to Honcut Creek	0	0	333	350	3	6
Honcut Creek to Yuba River	0	4	5	535	21	357
Yuba River to Bear River	8	0	24	179	105	183
Bear River to Sacramento River	0	0	0	0	238	6

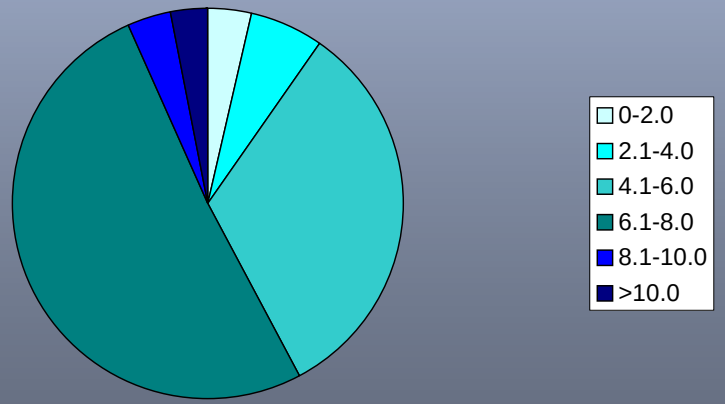
Substrate proportions by reach in the lower Feather River



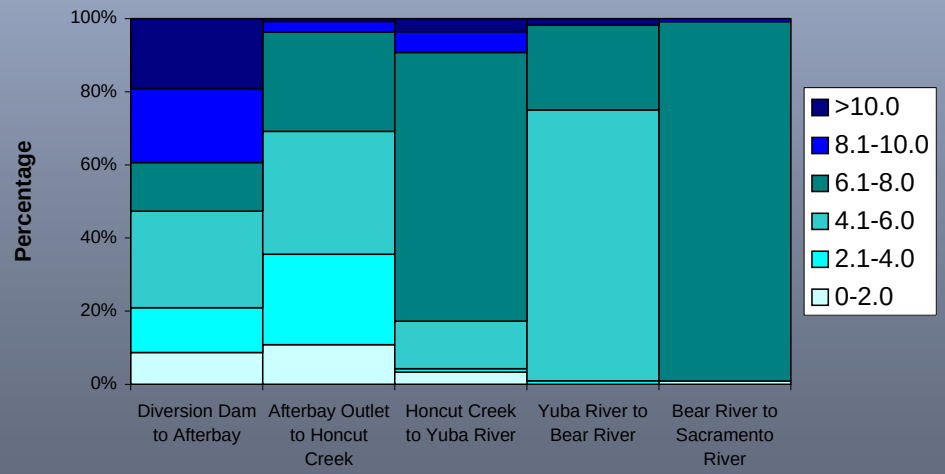
Results – Water Depth Distribution

Water depth strata (feet)	Diversion Dam to Afterbay	Afterbay Outlet to Honcut Creek	Honcut Creek to Yuba River	Yuba River to Bear River	Bear River to Sacramento River
0-2.0	24	60	20	0	6
2.1-4.0	34	136	6	8	0
4.1-6.0	72	185	76	639	0
6.1-8.0	37	150	432	200	708
8.1-10.0	55	16	33	0	6
>10.0	52	4	21	15	0

Water depth strata acreage by reach in the lower Feather River.

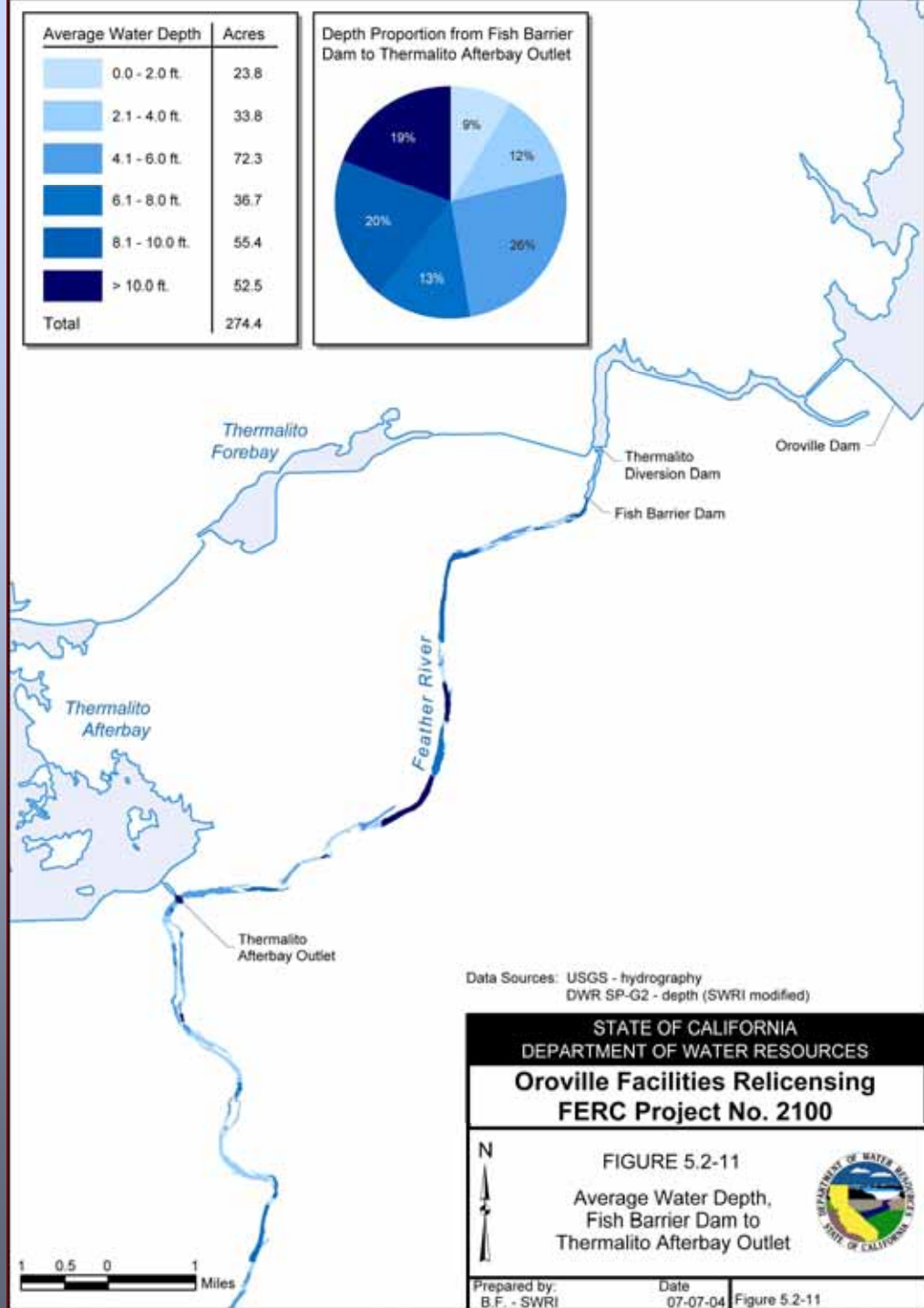


Proportions of water depth strata (ft) in the Feather River



Proportions of water (ft) depth strata in the lower Feather River by reach

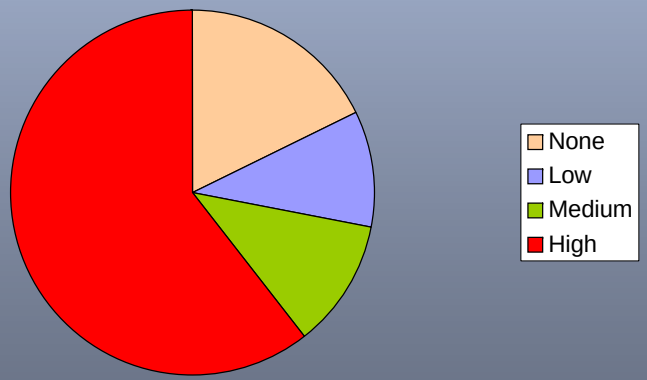
Results – Water Depth Distribution



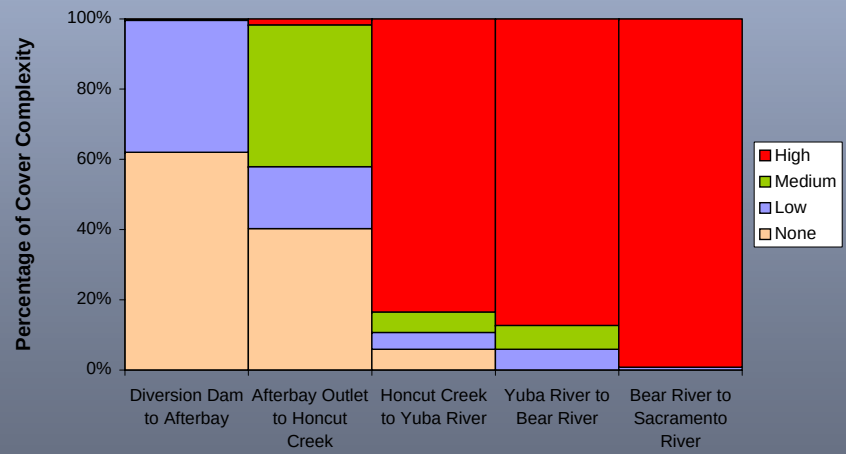
Results – Instream Cover Complexity

	Diversion Dam to Afterbay	Afterbay Outlet to Honcut Creek	Honcut Creek to Yuba River	Yuba River to Bear River	Bear River to Sacramento River
None	**170**	**222**	**35**	**0**	**0**
Low	**103**	**97**	**28**	**16**	**6**
Medium	**1**	**222**	**34**	**19**	**0**
High	**1**	**9**	**490**	**827**	**714**

Instream cover complexity acreage by reach

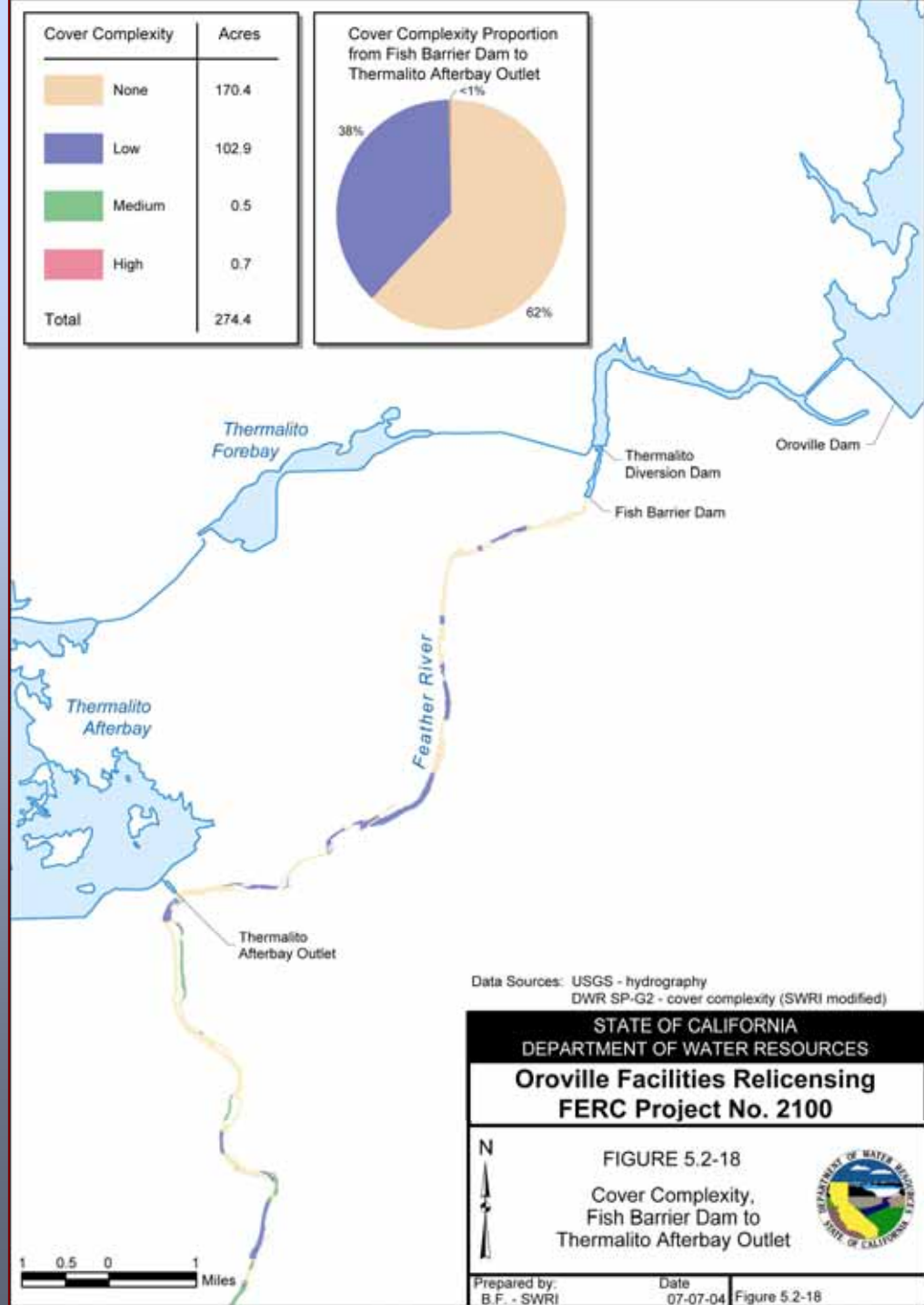


Proportions of instream cover complexity in the Feather River



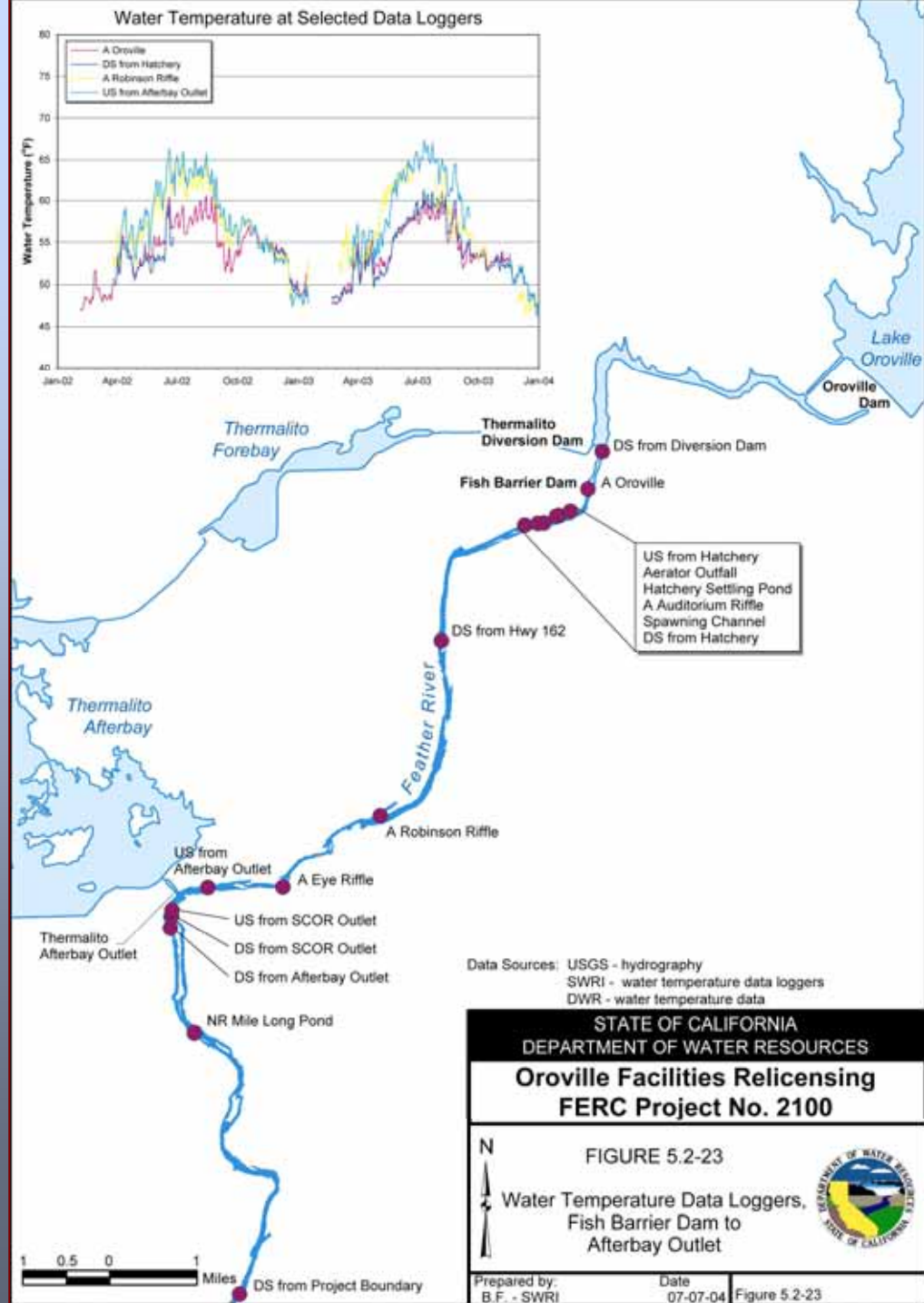
Proportions of water (ft) depth strata in the lower Feather River by reach

Results –
Instream Cover Complexity



Results – Water Temperature

- **Data Use**
  - **Point source data extrapolated**
  - **Tributary inflow**
  - **Comparison to species requirements**



Results – Water Quality Exceedences

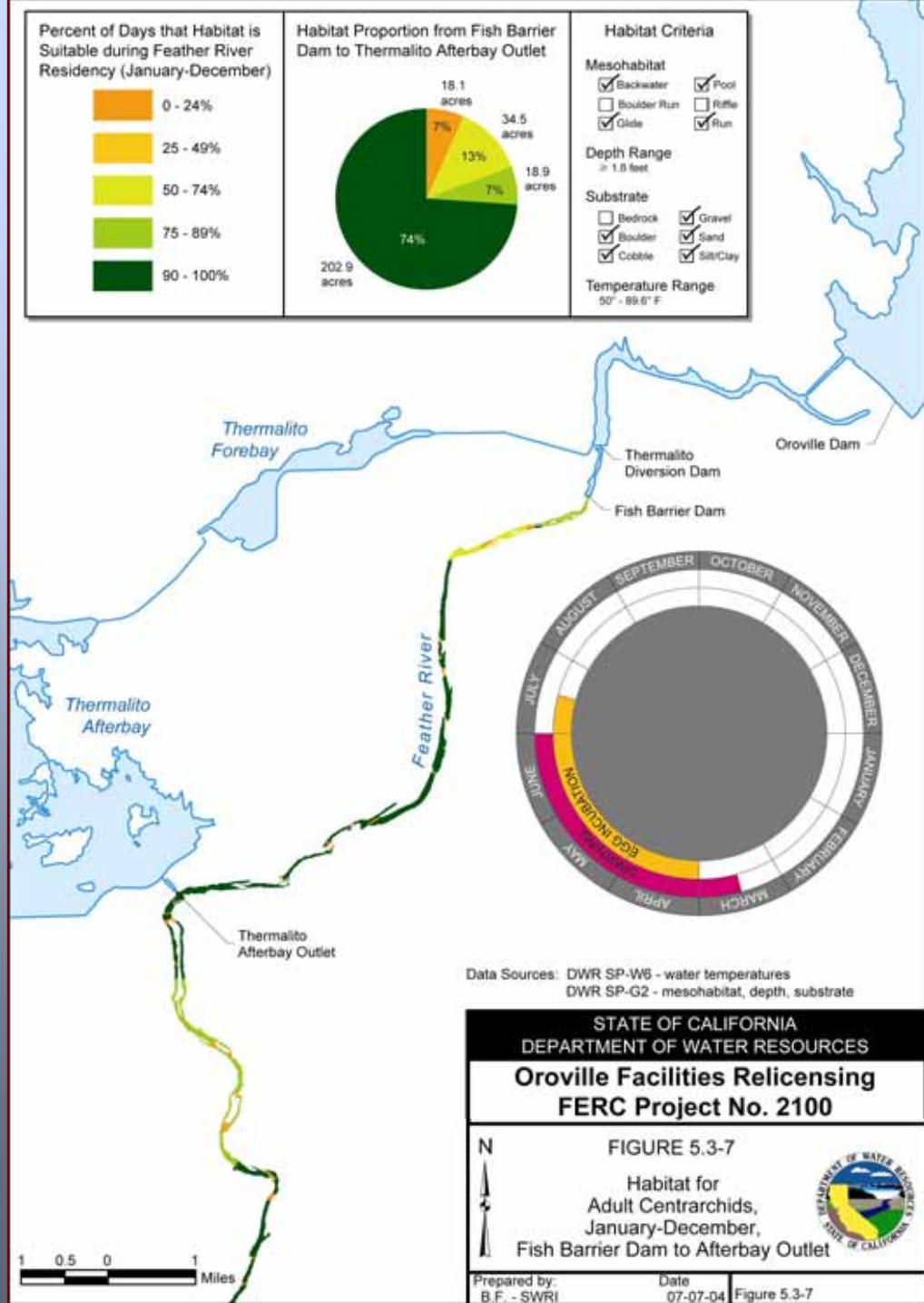
- **Exceedence of NAWQC or CTR occurred for three constituents**
  - **Total aluminum, total iron, total copper**

Summary table of water quality aquatic life criteria exceedences for total metals (mg/L) in the Lower Feather River from Honcut Creek to the Yuba River.

Number (%) of samples exceeding criteria or objectives	Aluminum	Copper	Iron
Feather R A Archer Ave Number of samples	17	17	17
CTR Aquatic Life	-	0	-
NAWQC Aquatic Life	10 (59%)	-	0
Yuba R A Mouth Number of samples	17	17	17
CTR Aquatic Life	-	0	-
NAWQC Aquatic Life	12 (71%)	-	0
Feather R US Yuba R Number of samples	16	16	16
CTR Aquatic Life	-	1 (6%)	-
NAWQC Aquatic Life	16 (100%)	-	1 (6%)

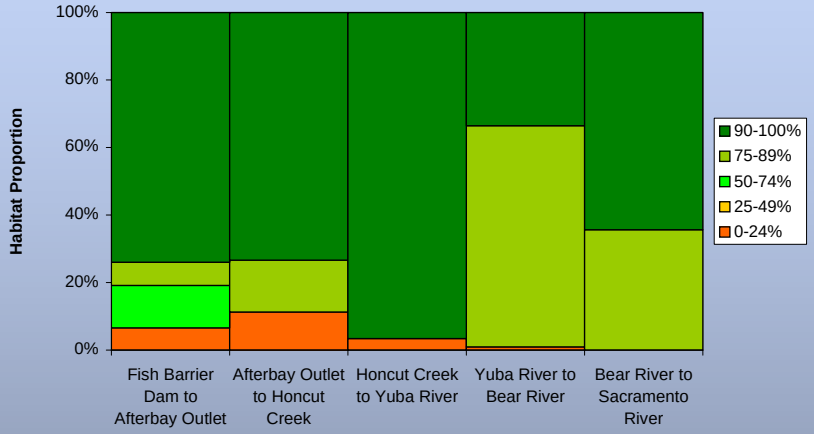
Results – Habitat Distribution

- **Proportion of Relative Habitat Suitability Classes**
  - **Zero to 24 percent**
  - **25 percent to 49 percent**
  - **50 percent to 74 percent**
  - **75 percent to 90 percent**
  - **90 percent to 100 percent**

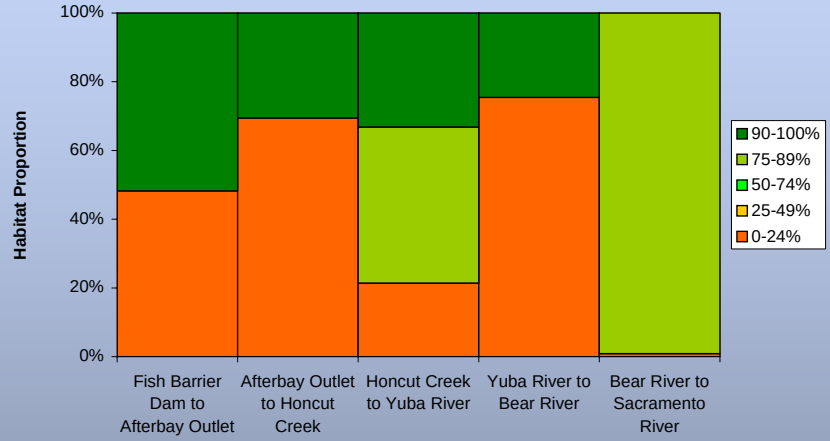


Results – Habitat Distribution

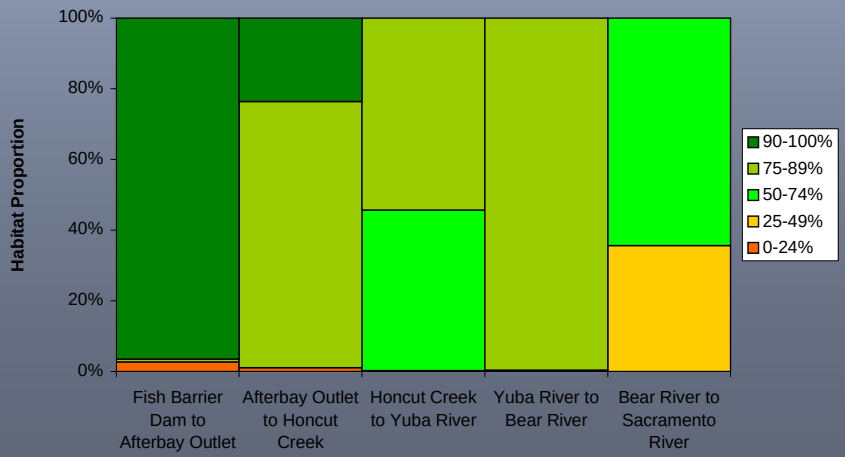
Proportion of centrarchid habitat in the lower Feather River by reach.



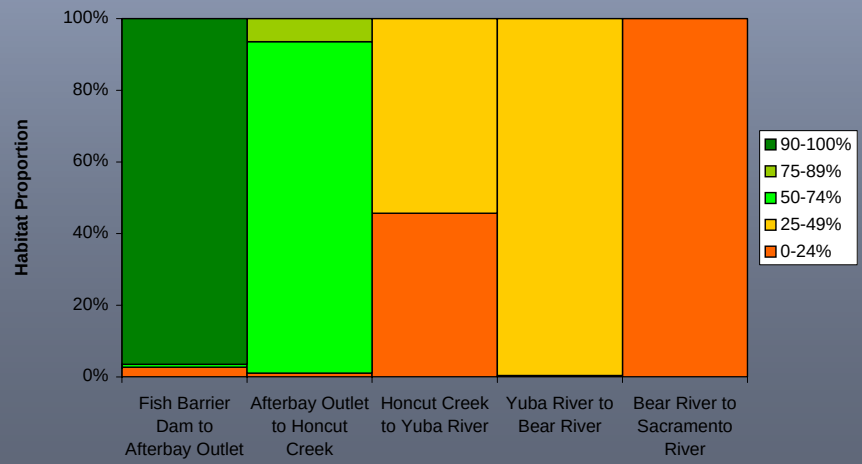
Proportion of green sturgeon habitat in the lower Feather River by reach.



Proportion of river lamprey habitat in the lower Feather River by reach.



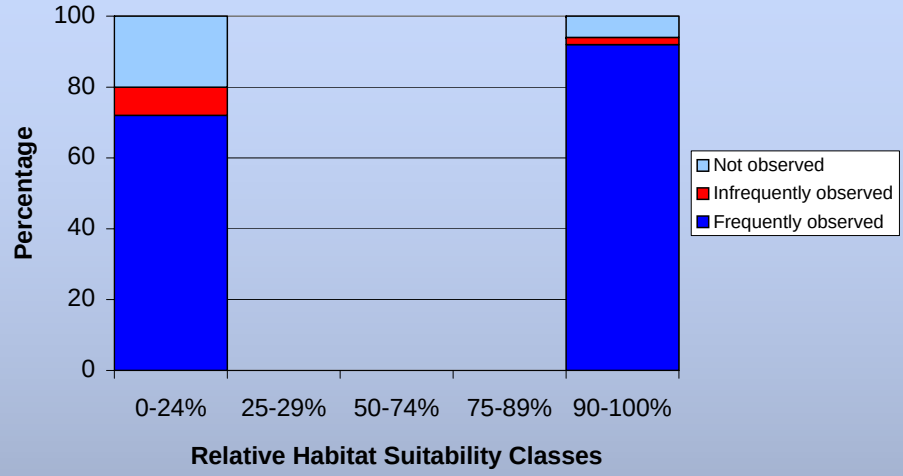
Proportion of Pacific lamprey habitat in the lower Feather River by reach.



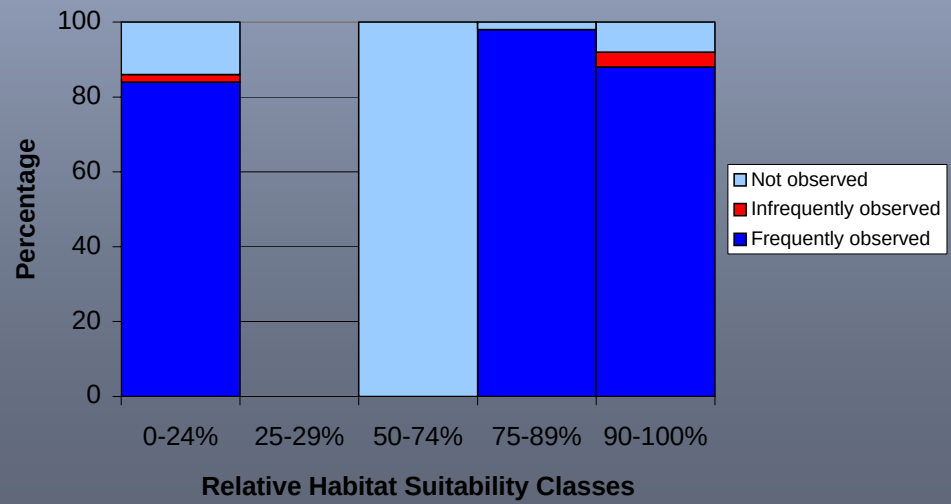
Results – Species Distribution vs. Habitat Distribution

- **Expose potential limitations of data**
- **Identify factors potentially limiting habitat availability**
- **Determine functional relationship between project operations and species and habitat distribution**

Relative abundance of American shad as a function of the proportion of relative habitat suitability



Relative abundance of centrarchids as a function of the proportion of relative habitat suitability



Analyses

- **Species Distribution**
  - **Same as fish relative abundance and distribution results as “Interim” report**

Analyses

- **Fish Habitat Components**
  - **Mesohabitat**
    - **Diversity decreased with distance downstream**
  - **Substrate**
    - **Course upstream with increasing component of fines with distance downstream**
  - **Water Depth**
    - **Deepest and most diverse upstream**

Analyses

- **Habitat Components**
  - **Instream Cover Complexity**
    - **Lowest upstream – highest downstream**
  - **Water Temperature**
    - **Coldest upstream**
  - **Water Quality**
    - **Three analytes exceeded criteria**
    - **Aluminum exceeded criteria most often**
    - **Exceedences occurred at all sample sites**

Analyses

- **Habitat Distribution**
  - **Habitat for ten species utilized only habitat components and habitat distribution was not affected by water temperature**
  - **Habitat for distribution and proportion of suitability was effected limited by water temperatures for six species**
- **Species Distribution vs. Habitat Distribution**
  - **Amount of agreement or disagreement allows decisions to be made on the appropriate use of the data**

Analyses

- **Project Related Effects**
  - **Specific changes in operations likely would alter quantity, quality, and distribution of habitat in the lower Feather River**
  - **Results of the fish habitat distribution and habitat requirements, potential operational changes can be utilized as the basis evaluate the effects on the quantity, quality and distribution of fish habitat**